What Determines the Level of Employee Premium Contributions for Health Insurance?

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Abstract

The first goal of this paper is to explore the determinants of the employee premium contribution (EPC) for health insurance using a formal economic model of a labor market. The model generates several clear-cut predictions: EPCs vary *positively* with tax deductibility of EPCs, premiums, and dispersion in employees' valuations of insurance; and EPCs vary *negatively* with income tax rates and the average employee valuation of health insurance. The model predicts that when EPCs are fully tax deductible, EPCs should be equal to the total premium. The second goal of this paper is to test whether the magnitudes of EPCs follow patterns consistent with the predictions of the model. The key question of whether EPCs are rising or have leveled off in recent years depends on how the EPC is defined. I argue that, in firms offering health insurance through a Section 125 cafeteria plan, EPCs are better measured by the full insurance premium rather than the monthly paycheck deduction. Using this alternative definition results is a much higher overall estimate of the EPC as a fraction of the premium. The empirical results are consistent with the theoretical prediction that EPCs as a fraction of the total premium should be higher for family coverage than for single coverage.

1. Introduction

For non-elderly Americans employers are the major source of health insurance, with around 80% of those with any coverage receiving it through an employer.[1] From the mid-1980s to the mid-1990s there was a large drop in the fraction of the non-elderly population with employer-sponsored coverage and, at the same time, an increase in the number of uninsured (see Figure 1). The decline in employer-sponsored coverage appears to be attributable entirely to declines in takeup and eligibility rather than offering.[2](Henry S Farber and Helen Levy, 2000)

These trends raise the question, Why did fewer employees take up health insurance coverage? This paper focuses on one likely suspect, the employee premium contribution (EPC). The EPC is the amount employers require their employees to contribute in order to enroll in an employer-sponsored health insurance plan. The first goal of this paper is to explore the determinants of the EPC using a formal economic model of a labor market. This model builds on and generalizes earlier theoretical work and is generally consistent with the results in these earlier works.(David Dranove et al., 2000, Helen Levy, 1997)

The model generates several clear-cut predictions: EPCs vary *positively* with tax deductibility of EPCs, premiums, and dispersion in employees' valuations of insurance; and EPCs vary *negatively* with income tax rates and the average employee valuation

of health insurance. The model predicts that when EPCs are fully tax deductible, EPCs should be equal to the total premium.

The second goal of this paper is to examine the magnitudes of EPCs using the 1999 Kaiser Family Foundation and the Health Research and Educational Trust (KFF/HRET) employer survey. I use this employer survey data to test whether EPCs follow patterns that are broadly consistent with the predictions of the model. Given that employers can make EPCs tax deductible by establishing a Section 125 plan, the model suggests that (assuming switching to a Section 125 plan is costless), then EPCs should be equal to the total premium or at least trending in that direction. On this key question, the empirical results are mixed and depend on how the EPC is defined. Other researchers typically define EPCs as the amount deducted from an employee's paycheck.(Allan P Blostin and Jordan N Pfuntner, 1998, Kaiser Family Foundation, 2002) I argue that, in firms offering health insurance through a Section 125 cafeteria plan, EPCs are better measured by the full insurance premium. Using this alternative definition results is a much higher overall estimate of the EPC as a fraction of the premium. The empirical results are consistent with the theoretical prediction that EPCs as a fraction of the total premium should be higher for dependent coverage than for single coverage. In firms with many low-income workers, EPCs are more likely to occur through monthly paycheck deductions; in firms with few low-income workers EPCs are more likely to occur through Section 125 cafeteria plans.

The paper is structured as follows. In section 2 I introduce the building blocks of a theory of the EPC: individuals' valuation of health insurance, tax treatment of employer and employee contributions, and idiosyncratic firm preferences. This section discusses the equilibria in a variety of simple scenarios without the use of formal proofs in order to establish some intuition regarding the results generated by the full model. In section 3 I develop a formal mathematical model of a labor market in which individuals vary in their valuation of health insurance and in their firm preferences. The model developed in section 3 generates results that go beyond the simple intuitive results in section 2. In section 4 I summarize the model results and illustrate the effect of varying the key exogenous parameters (the distribution of individuals' valuation of insurance, the tax rate, the tax deductibility of EPCs, and the premium) on equilibrium wages and EPCs. In section 5 I introduce the employer survey data, discuss alternative definitions of the EPC, and compare the estimated EPCs to the predictions of the model. Section 6 concludes.

2. Building blocks of a theory of the EPC

2.1 Individuals' valuations of health insurance

The first element in the theory is the individual's valuation of health insurance. This is equivalent to the concept of the compensating differential in labor economics. Suppose that an individual has a utility function, $U_i(TAKEHOME_i, INSURANCE_i)$ that depends on take-home income, $TAKEHOME_i$, and whether or not the individual receives health insurance from the employer ($INSURANCE_i$=1 if yes, 0 if no). The individual's valuation of health insurance, $VALUATION_i$, is defined by:

$$U_i(TAKEHOME_i - VALUATION_i, 1) \equiv U_i(TAKEHOME_i, 0) \qquad \text{(eq 1}$$

For a given individual, the valuation of health insurance will depend on several factors:

1) Whether the insurance is "relevant". Insurance coverage for dependents is not relevant to a single person with no children.

2) Other sources of insurance. If the individual has a spouse who works at a firm that offers a family plan with a zero EPC, then that individual will have a low or zero valuation for insurance. Similarly, an individual who is herself not eligible for Medicaid but whose children are eligible would have a high valuation for single coverage, but low valuation for insurance coverage for dependents.

3) The difference between services received given insurance and services received given no insurance (where "services" includes waiting time, location, stigma etc). If an individual has good access to free care for the uninsured and there is no stigma attached to receiving these services, then the individual will receive the same services whether he has insurance or not and will, therefore, have low valuation for insurance.

4) The valuation of the services that are only received when the person is insured. If the individual foregoes services due to not having insurance, but does not value the foregone services, then the valuation of insurance is low.

5) The valuation of the financial protection (smoothing of disposable income across states of the world) provided by insurance.

6) The individual's income (wealth effect), and health status.

The distribution of valuations across a set of individuals will depend on the distributions of each of these factors.

2.2 Tax treatment of employer and employee contributions

The second key theoretical element is the tax treatment of employer and employee contributions to the purchase of health insurance. The federal government has for many decades treated employer contributions to the purchase of health insurance as a pre-tax business expense rather than a taxable component of employee income.(Paul Starr, 1982) Until 1978, when the federal Revenue Act (which contained Section 125) was passed, employee contributions could only be paid out of after-tax

income. The difference between the treatment of employer and employee contributions created an obvious incentive for employers to contribute the full amount of the health insurance premium.

Suppose that there is a uniform tax rate, TAX, a fixed health insurance premium, PREMIUM, and that employees receive a uniform wage and health insurance and contribute an amount, EPC, to the premium out of after-tax income. The employee is indifferent between two scenarios: 1) receiving a wage, WAGE, and paying an EPC equal to the premium, and 2) receiving a wage WAGE-PREMIUM/(1-TAX) and paying an EPC equal to 0. The total compensation paid by the firm in scenario 1) equals WAGE and in scenario 2) equals WAGE-PREMIUM[TAX/(1-TAX)]<WAGE. The firm clearly prefers the second scenario. A similar story can be told in which firms are indifferent between scenarios and employees clearly prefer the scenario in which the firm contributes the full premium.[3]

2.3 Equilibria when employer contributions are tax deductible and employee contributions are not

Suppose that all individuals have the same productivity, PRODUCT, employer contributions are tax deductible and employee contributions are not, and there are two identical firms (same technology, no idiosyncratic preferences) that compete for workers by offering a single contract, {WAGE,EPC}. If all individuals share the same valuation of health insurance, then either: 1) both firms will offer {PRODUCT-PREMIUM,0}

and all individuals will take up insurance or 2) both firms will offer {PRODUCT,EPC>VALUATION} and no individuals will take up insurance. Scenario 1 (all workers insured) will occur only when VALUATION>PREMIUM(1-TAX). In neither scenario will any workers pay a positive EPC.

Now suppose that workers vary in their valuations of health insurance; for some workers $VALUATION_i$>PREM(1-TAX), and for others $VALUATION_i$<PREMIUM(1-TAX). If firms are identical (same technology, no idiosyncratic preferences) then one firm will offer {PRODUCT-PREMIUM,0} and the other firm will offer {PRODUCT,EPC>PREMIUM(1-TAX)}. All individuals with $VALUATION_i$>PREMIUM(1-TAX) work at the first firm and take up and all other individuals work at the other firm and do not take up. Again, no workers will pay a positive EPC.

If firms are no longer identical (same production technology but now workers have idiosyncratic preferences for working at one firm or the other), and each firm can offer two contracts, then both firms will offer one contract with EPC=0 and another with EPC>PREMIUM(1-TAX). Workers, within firms, will sort themselves into the high-EPC and no-EPC contracts according to whether $VALUATION_i$>PREMIUM(1-TAX). Once again, no workers will pay a positive EPC.

2.4 When will workers pay a positive employee premium contribution?

There are two scenarios in which workers might pay a positive EPC. In the first scenario, workers have idiosyncratic firm preferences and heterogeneous valuations of health insurance (specifically, for some i's $VALUATION_i<PREMIUM(1-TAX)$ and other i's $VALUATION_i>PREMIUM(1-TAX)$) and firms can only offer a single contract. This will result in a mix of high- and low-valuation individuals in the same employment contract at the same firm. In this case, charging a small, positive EPC will maintain some of the tax advantage of the employer contribution while encouraging low-valuation individuals not to take up insurance (thereby freeing insurance premiums to be converted into wages and/or profits).

In the second "positive EPC" scenario, employee contributions are fully tax deductible. When employee contributions are fully tax deductible, there is no tax advantage to be gained by having the employer contribute to the purchase of insurance. If for some i's $VALUATION_i<PREMIUM(1-TAX)$ then firms will offer a contract with $EPC=PREMIUM$, and workers will only take up insurance if $VALUATION_i>PREMIUM(1-TAX)$.

3. Model of a Dual Market for Labor and Health Insurance

3.1 Summary of the Model

I use a two-firm model in which firms with the same production technology compete for workers by offering a contract {WAGE,EPC} consisting of a wage and an EPC for an optional health insurance plan. Individuals vary in their preference for working at one firm or the other and in their valuation of health insurance. Firms choose whether or not to offer insurance, individuals choose whether to work and, if they do work, whether to take up insurance. I use the Nash equilibrium concept to identify equilibrium wages and EPCs. A firm's profits are calculated as a function of its own contract offer and the other firm's contract offer. Because this profit function is discontinuous, I use a "brute force" computer simulation to identify equilibria rather than closed-form first order conditions. Equilibria wages and EPCs are calculated repeatedly using different values for the exogenous parameters. This repeated simulation maps out the relationship between EPCs and the distribution of individuals' valuations, the tax deductibility of EPCs, etc.

3.2 Firm behavior

There are two firms that use the same constant returns to scale (CRS) production technology. This technology requires only labor as an input. The price of the output good is fixed and is normalized so that the marginal product (and, given CRS, average

product) of a unit of labor is $1000. All individuals have the same productivity. There are many individuals for whom the firms compete by offering a contract that consists of a wage and an EPC. Workers who take up the health insurance plan pay a nonnegative EPC chosen by the firm. Both firms always offer a health insurance plan, but the firms can choose an EPC so high that no one will enroll, thereby effectively not offering insurance. The EPC may (depending on the parameter values chosen by the user) be partially or fully tax deductible. Within a firm, all workers receive the same wage and, if they take up, pay the same EPC. Both firms pay the same fixed insurance premium (out of pre-tax dollars) for each employee that takes up.

3.3 Individual behavior

Individuals have an additive utility function that depends on whether they work, their after-tax and after-EPC income, which firm they work at, and whether they have insurance. Individuals choose whether to work and, if they work, which firm to work at and whether to take up insurance. If an individual does not work, she receives a reservation utility. Individuals vary in their firm preference and their valuation of health insurance. Firm preference can be thought of as the negative of commuting distance (though many other analogies would work equally well); imagine firm 1 at one point and firm 2 at another with the individuals living on the straight line in between. An individual's utility from working at a firm equals after-tax income minus the commuting distance measured in compensating-differential dollars (plus, if the individual takes up, net utility from having insurance and paying the EPC). The

distribution of individuals' valuation of health insurance is described by three parameters: the fraction of individuals with non-zero valuation, and the minimum and maximum valuations among those with non-zero valuation. Among those with non-zero valuation, valuations are distributed uniformly over the interval from the minimum to the maximum. An individual would have a valuation of zero, for example, if the health insurance benefit only covers children and the individual has no children. Valuation of health insurance does not depend on which firm provides the insurance.

3.4 Equilibrium concept

Firms choose the profit-maximizing contract taking the other firm's behavior as fixed (Cournot competition). The equilibrium concept is straightforward pure-strategy Nash equilibrium (I do not test for mixed-strategy equilibria). For a given set of parameter values, the set of Nash equilibria consists of all contract pairs (one for each firm) given which neither firm can increase profits by offering a different contract.

3.5 Formal definition of variables used in the model

Table 1 formally defines individual's utilities and firm 1's profits (firm 2's profits are symmetrical). The choice variables are listed in table 2 and the exogenous parameters and their default values are listed in table 3. In each simulation, only the value of the key parameter is varied. All other parameters are set at their default values.

3.6 Calculation of profits

Profits for firm 1 equals the probability that an individual works at firm 1 and does not take up multiplied by the profit for firm 1 given no take up plus the probability that an individual works at firm 1 and takes up multiplied by the profit for firm 1 given take up (all multiplied by the number of individuals). The probability that an individual works at firm 1 and does not take up is the joint probability that an individual will prefer that option to each of the other four options: not working, working at firm 1 and taking up, working at firm 2 and not taking up, working at firm 2 and taking up. I rearrange the utilities from above and express them as the following set of inequalities in Table 4. Using the inequality labels from table 4,

total profit for firm 1 per individual = (eq 2

$$(1 - \text{WAGE}_1) * P[\text{constraints \#1 through \#4 satisfied}] +$$

$$(1-\text{WAGE}_1-\text{PREMIUM}+\text{EPC}_1) * P[\text{constraints \#5 through \#8 satisfied}]$$

Imposing this structure on the model has several implications, some trivial and some non-trivial. A trivial (but convenient) implication is that individuals are distributed uniformly over a rectangle with the firm preference parameter (E) on one axis and valuation of health insurance (VALUATION) on the other. This distributional assumption makes computation of equilibria relatively convenient but is not central to the setup of the model. Another trivial feature of the model setup is that individuals' preference parameters (E and VALUATION) and utilities are measured in units of after-

tax income; they could just as easily be measured in pre-tax income without affecting the results.

3.7 Identification of Equilibria

A SAS dataset is created with one observation for every combination of $WAGE_1$, $WAGE_2$, EPC_1, and EPC_2 where wages take values between RES and 1 (inclusive) in increments of \$10, and EPCs take values between 0 and VALMAX (inclusive) in increments of \$5.[4] I then specify values for each of the exogenous parameters, with the default values listed in table 3.

Profits per individual for firm 1 are calculated for every combination of $WAGE_1$, $WAGE_2$, EPC_1, and EPC_2 using the inequalities from table 4. For each combination of $WAGE_2$ and EPC_2, the set of firm 1's best (profit-maximizing) responses are then selected. Equilibria are then identified by selecting the set of observations where firm 1 is best-responding to firm 2 and firm 2 is best-responding to firm 1. This is simplified by the fact that the firms have symmetrical profit functions. This process is repeated with different values for the exogenous parameters to sketch out the relationship between the exogenous parameters and the equilibrium wages and EPCs.

Multiple equilibria (for fixed values of the exogenous parameters) and asymmetrical equilibria (where $WAGE_1$ and $WAGE_2$ or EPC_1 and EPC_2 differ) are possible and do occur. To select an equilibrium for presentation in this paper, profits for firms 1 and 2 are

added and the equilibrium with the highest total profits is chosen.[5] To calculate average EPCs and wages for each equilibrium, the EPCs and wages at the two firms are averaged using the number of covered workers at each firm as the weight. These calculations is performed in SAS. The SAS code and supporting files are available to be downloaded from http://www.people.fas.harvard.edu/~cdwhite/Chapin_White.home.html. (Chapin White, 2002)

4. Model Results

To generate the results shown in table 5, one parameter is varied at a time with all other parameters set at their default values (see table 3). Briefly, the model predicts that EPCs vary *positively* with tax deductibility of EPCs, premiums, and dispersion in employees' valuations of insurance; and EPCs vary *negatively* with income tax rates and the average employee valuation of health insurance.

Maximum valuation of health insurance. When the maximum valuation is below a threshold, firms set their EPC high enough so that no workers take up. When the maximum valuation exceeds this threshold, the equilibrium EPC begins to fall and eventually reaches $0.

Fraction of individuals with nonzero valuation of health insurance. As this fraction rises, the equilibrium EPC falls and eventually reaches $0.

Income tax rate. When the income tax rate is 0%, the equilibrium EPC is $150 (equal to the premium) and, given the distribution of valuations of health insurance, the take-up rate is 63%. This no-tax equilibrium achieves allocative efficiency, meaning that only those individuals with a valuation of health insurance greater than the social cost take up the insurance. As the income tax rate rises, the equilibrium EPC falls and eventually reaches $0, and the fraction of workers taking up rises to 100%.

Fraction of Employee Premium Contribution that is tax deductible. As tax deductibility rises, the equilibrium EPC rises and the fraction taking up drops. When fully tax deductible, the equilibrium EPC is $150 (equal to the premium) and the take-up rate is 74%. Note that the take-up rate given fully deductible EPC is higher than the take-up rate given an income tax rate of 0%; this reflects the tax distortion toward purchase of employer-sponsored health insurance in the case of a positive income tax and a fully deductible EPC.

Health insurance premium. Below a threshold, as the premium rises the EPC remains at $0, take-up remains at 100% and the increases in the premium are shifted 1-for-1 onto wages. Above this threshold, premium increases result in a more-than-1-for-1 increase in EPC, a rapid drop in take-up and a small increase in wages.

Distribution of valuations of health insurance. Holding mean valuation constant, an increase in the dispersion of valuations is associated with an increase in the equilibrium EPC and a drop in take-up.

5. Empirical Analysis

5.1 Predictions to be tested

The model results include several testable predictions. Perhaps the most intriguing is the prediction that tax deductibility of EPCs results in the EPC being equal to the premium. Also worth testing is the prediction that low valuations of health insurance (either due to a low fraction of individuals with non-zero valuations or low minimum and maximum valuations conditional on being non-zero) are associated with higher EPCs. I test the second prediction by sorting firms according to the fraction of their workforce with low incomes and measuring EPCs as shares of premiums. Assuming that low-income individuals have lower valuations of health insurance (due to the wealth effect as well as increased availability of public insurance through CHIP/Medicaid), firms with a large contingent of low-income workers should have higher EPCs.

5.2 Data on EPCs

To estimate the magnitude of EPCs I use publicly available data from a 1999 employer survey done by the Kaiser Family Foundation and the Health Research and Educational Trust (KFF/HRET). This firm-level survey asks employers whether they offer health insurance, what types of plans they offer (plans are categorized by KFF/HRET as conventional, health maintenance organization, preferred provider organization, or point-of-service), what fraction of enrollees are in each type of plan, and the total

premium and the amount deducted from an employee's monthly paycheck for each plan. This survey has been conducted since 1988. I only used the 1999 data because earlier years are not publicly available and the more recent questionnaires (for 2000 and 2001) do not include questions on Section 125 cafeteria plans.

5.3 Section 125 plans and measurement of employee premium contributions

The KFF/HRET survey asks whether the firm offers a Section 125 cafeteria plan. Among employees with health insurance coverage, 29% were at a firm offering health insurance through a cafeteria plan. As defined by the Internal Revenue Service in Section 125 of the Internal Revenue Code, "a cafeteria plan is a written plan that allows your employees to choose between receiving cash or taxable benefits instead of certain qualified benefits" such as health benefits or dependent care assistance. (Internal Revenue Service, 2002) There are two other types of Section 125 plans: "premium conversion plans" (also known as "premium-only plans") and "flexible spending accounts." A premium conversion plan allows EPCs to be deducted from pre-tax dollars. A flexible spending account allows employees to set aside pre-tax income at the beginning of the year to be used for health care or dependent care expenses not covered by insurance, such as copayments for prescription drugs; unused funds are forfeited at the end of the year. The three types of Section 125 plans can exist in any combination.(Employee Benefits Research Institute, 1997) Unfortunately, the Section 125 terminology is not well agreed upon and usage varies from source to source.[6]

The conceptual issue is whether, among employers offering health insurance through a cafeteria plan, the EPC is best characterized by the monthly deduction, or by the full premium amount, or zero. Typically, a firm with a cafeteria plan allocates each employee a certain number of "benefits bucks" or points to spend on either health insurance, 401(k) contributions, vacation time or cash wages. If an employee takes up health insurance through a cafeteria plan and if the entire premium amount could have been converted into some other benefit or wages, then one approach to defining the EPC is to treat the entire premium as the employee's contribution.[7] A second approach is to treat the monthly paycheck deduction as the EPC. A third approach is to treat the employee's contribution as zero, given that the employer gives the employee the "benefit bucks" used to buy health insurance. I prefer the first approach because it fits with the notion that the EPC is, from the employee's point of view, the price of insurance.

5.4 Alternative definitions of the employee premium contribution

The method of defining EPCs when the employer uses a cafeteria plan dramatically affects the estimated magnitudes. I calculate the EPC in four flavors: the "paycheck deduction (as is)" EPC, the "paycheck deduction only" EPC, the "cafeteria only" EPC, and the "paycheck deduction plus cafeteria" EPC. As detailed in Table 6, the "paycheck deduction (as is)" EPC always equals the monthly paycheck deduction recorded in the survey. The value of the other EPC variables depends on whether the

firm uses a cafeteria plan. At firms that do not use a cafeteria plan, the "paycheck deduction only" EPC and the "paycheck deduction plus cafeteria" EPC equal the "paycheck deduction (as is)" EPC, and the "cafeteria only" EPC equals $0. At firms that use a cafeteria plan, the "paycheck deduction only" EPC equals $0, and the "cafeteria only" EPC and the "paycheck deduction plus cafeteria" EPC both equal the total insurance premium. In calculating the firm-level health insurance premiums and EPCs I weight premiums and EPCs for each of the four types of plans by the fraction of employees enrolled in those plans. In calculating results across all firms, I weight the firm-level data by the number of covered employees.[8]

As shown in Table 6, the choice of definition of the EPC dramatically affects the estimated magnitude of the EPC. The "paycheck deduction (as is) EPC" equals 14.3% of the premium for single plans and 26.8% of the premium for family plans. The "paycheck deduction plus cafeteria EPC" equals 40.6% of the premium for single plans and 50.7% of the premium for family plans.

5.5 Are employee premium contributions increasing?

Researchers from the Bureau of Labor Statistics (BLS) used data from the Employee Benefits Survey to measure trends in EPCs. They find that EPCs, relative to the medical care CPI, were flat from 1983 to 1986, then spiked sharply upward from 1986 to 1991, and then remained fairly level from 1991 to 1995.(Allan P Blostin and Jordan N Pfuntner, 1998) When generating these results, however, employers that used "a

'cafeteria plan' or employer-sponsored reimbursement account" were excluded from the sample, presumably because of the difficulty in calculating the employee contribution in these cases. This exclusion affected 15% of the employees in the 1995 sample. If, as is likely, the use of cafeteria plans was increasing over this period, then the use of a "paycheck deduction plus cafeteria" EPC definition would result in a very different trend.

The Kaiser Family Foundation use earlier versions of the survey I use to calculate employee contributions as a fraction of the total premium for selected years from 1988 to 2001.(Kaiser Family Foundation, 2002) Their results (shown in Figure 2) are based on the "monthly paycheck deduction" question in the employer survey. These data show that the employee share for single plans rose sharply between 1988 and 1996 and then declined, and the employee share for family plans was flat over the entire period.

I Figure 2 I superimpose alternative estimates of the single and family employee shares, with the employee contribution at firms with a cafeteria plan defined as being equal to the full premium. These estimates for 1999 are dramatically higher than the published figures. Given that the prevalence of Section 125 cafeteria plans was likely increasing over this period,[9] a "paycheck deduction plus cafeteria" definition of the employee share would almost certainly show a very different time trend.

5.6 Are EPCs higher for family plans?

The fact that coverage for dependents is only relevant to a fraction of all workers suggests that EPCs as a fraction of the total premium should be higher for family coverage. In 1999, the average total monthly premium for an employer-sponsored single plan was $174 and the average "paycheck deduction plus cafeteria" EPC was $71 (40.6%). For a family plan the average total premium was $474 and the average "paycheck deduction plus cafeteria" EPC was $240 (50.7%). If we treat family coverage as a combination of single coverage and coverage for dependents, then coverage for dependents has an average premium of $300 ($474-$174) and an average EPC of $169 ($240-$71). This makes the EPC as a fraction of total premium for dependent coverage 56.3%, higher than the fraction for single coverage. This is consistent with the fact that dependent coverage is only relevant to a fraction of all workers, whereas coverage for the worker herself is relevant to all workers.[10]

5.6 Do firms with many low-income workers charge higher EPCs?

Unfortunately, estimates of the EPC using the KFF/HRET employer survey are not precise enough to test whether the the EPC as a fraction of the premium is higher at firms with many low-income workers.[11] I sort firms according to the fraction of their workforce made up of low-income workers (defined in the KFF/HRET survey as earning $20,000 or less). As shown in table 8, I find that firms with few (less than 10%) low-income workers are more likely than firms with many low-income workers (greater than 35%) to use cafeteria plans (36.6% versus 22.7%). Firms with many low-

income workers, on the other hand, are more likely than firms with few low-income worker to have a paycheck deduction greater than $0 (85.8% versus 69.4% for single plans and 97.3% versus 76.4% for family plans). For this analysis I define having a paycheck deduction greater than $0 as the "paycheck deduction (as is)" EPC for the most popular plan (at the firm level) being greater than $0. Unfortunately, all the estimates are quite imprecise, so these results are merely suggestive. If there is a differential use of paycheck deductions and cafeteria plans, it probably reflects the fact that the non-discrimination rules in Section 125 require employers who use a cafeteria plan to offer similar benefits to all workers; low-wage workers probably prefer cash wages to a compensation package that includes a fixed and relatively large pot of "benefit bucks" (assuming the total compensation is the same).

6. Discussion

The most striking prediction of the model is that making EPCs fully tax deductible results in EPCs becoming equal to the full premium. One implication of the EPC rising to equal the full premium is a decrease in takeup due to low-valuation individuals dropping their coverage. This stylized story appears to be somewhat consistent with actual trends in EPCs and coverage (if we use the "paycheck deduction plus cafeteria" definition of the EPC). Low-valuation individuals dropping coverage either represents a step toward more efficient allocation (of individuals into insurance and uninsurance) or a widening of the cracks in our health care system, depending on your point of view.

One interesting question is why, even if EPCs are made fully tax deductible, we might not see EPCs equal to the full premium. One possibility is that doing so would lead to adverse selection "death spirals," either at the level of the plan (if the employer offers several plans) or at the level of the employer.(David M Cutler and Sarah J Reber, 1998) Another possibility is that firms that fear raising wages (because of the near impossibility of decreasing them later) but want to attract employees might compete by offering more-generous (low-EPC) benefits. The employer later can decrease total compensation by freezing wages and increasing the EPC. In such a situation I suspect that the firm would argue that they were "forced" by rising health insurance premiums to increase the EPC.

The results in this paper are relevant to the measurement of Medicaid/CHIP crowdout.(David M Cutler and Jonathan Gruber, 1996) When Medicaid/CHIP eligibility expands, an obvious and direct effect is to encourage newly eligible individuals to shift from employer-sponsored to public coverage. The model developed in this paper predicts that there could also be an indirect effect on the wages and EPCs faced by all individuals (including the never eligibles and the always eligibles). If a Medicaid/CHIP eligibility expansion increases the EPC faced by all workers, then the "full" crowdout effect (number of workers losing employer-sponsored coverage due to eligibility expansions divided by number of workers gaining public coverage due to eligibility expansions) will differ from the "administrative" crowdout effect (number of new enrollees in public insurance who formerly had employer-sponsored coverage divided by number of new enrollees in public insurance). This phenomenon could explain why the use of different methodologies to measure Medicaid crowdout leads to widely divergent results.(David M Cutler and Jonathan Gruber, 1996, L C Dubay and G M Kenney, 1996, Esel Y Yazici and Robert Kaestner, 1998)

The EPC plays a central role in determining who gets insurance coverage and what type of coverage they get. In the last few years, researchers have attempted to address the relative lack of theoretical and empirical work on its determinants.(David Dranove, Kathryn E Spier and Laurence Baker, 2000, Jonathan Gruber and Robin McKnight, 2002, Helen Levy, 1997) The theoretical arguments made by these researchers are fairly consistent with each other and with the arguments in this paper. Empirical work is perhaps the more fruitful avenue, though this work is made

difficult by the paucity of suitable data.(William Wiatrowski et al., 2002) The development of a conceptually sound and statistically robust measure of the EPC might, for starters, help settle the simple question of whether EPCs have leveled off or continue to rise.

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[1] Author's calculation based on fraction uninsured and fraction with employer-sponsored coverage among the non-elderly in 1998. **National Center for Health Statistics**. "Health, United States, 2001," Hyattsville, Maryland: Public Health Service, 2001.

[2] As defined in **Farber**, **Henry S and Levy**, **Helen**. "Recent Trends in Employer-Sponsored Health Insurance Coverage: Are Bad Jobs Getting Worse?" *Journal of Health Economics*, 2000, *19*(1), pp. 93-119., the offer rate is the probability that a worker works at a firm that offers health insurance to at least some of its employees. The eligibility rate is the probability that a worker, conditional on being at a firm that offers, is eligible for health insurance. The takeup rate is the probability that a worker, conditional on being at a firm that offers and being eligible, chooses to enroll.

[3] The tax deductibility of health insurance premiums, whether they be contributed by the employer or employee, also decreases the price of (subsidizes) health insurance relative to goods employees can only purchase with after-tax dollars.

[4] Given that halving both increments increases the number of observations by a factor of 16, (more generally, the number of observations varies with the product of the squares of the inverses of the two increments) these relatively large increments were necessary for computability.

[5] In general, when multiple equilibria occur they are adjacent, meaning that the wages and EPCs at the different equilibria are within an increment or two of each other. In rare cases multiple equilibria occur in which one equilibrium is symmetrical and another equilibrium is asymmetrical. In these cases the highest-profit criterion tends to select the asymmetric equilibria.

[6] The 1999 KFF/HRET survey instrument is somewhat confusing in its treatment of cafeteria plans. In item G3 firms are asked whether they offer "a cafeteria plan, a type of flexible benefit plan, where employees may choose between benefits based on a fixed dollar amount or a fixed number of points." Firms that say they do offer a cafeteria plan are then asked a follow-up question, item G4, whether employees receive "cash or other forms of compensation if [health insurance] coverage is waived." **Kaiser Family Foundation and Health Research and Educational Trust**. "Health Benefits 1999 Questionaire," 1999. This implies that a firm can offer a cafeteria plan without offering cash or other forms of compensation in lieu of health insurance; this appears to conflict with the Internal Revenue Service definition of a cafeteria plan. **Internal Revenue Service**. "Cafeteria Plans," Internal Revenue Service, 2002. Business Week, in an article from May 10, 2000, uses the terminology even more confusingly by using "Section 125 cafeteria plans" to refer to premium-only plans and flexible spending accounts, with no mention of what I have defined as a cafeteria plan. **Lee**, **Mie-Yun**. "Use Cafeteria Plans to Pay for Healthcare with Pre-Tax Dollars," *Business Week*. 2000.

[7] The KFF/HRET survey does not provide details on how cafeteria plans operate. It would be useful to know whether the "benefit buck" price of a health insurance plan is typically equal to the full premium. I have assumed that

this is the case, though the "benefit buck" prices assigned to various benefits could certainly deviate from the cost to the employer of providing the benefit. The ideal measure of the EPC would be the dollar value (to the employer) of the compensation that the employee has to forego in order to take up health insurance.

[8] The KFF/HRET dataset includes the number of covered employees ("COVNUM") and a weighting variable designed to weight up to the universe of covered employees ("COVWT"). COVWT is the product of COVNUM and an employer-level weighting variable. Because of extreme variability in the employer-level weighting variable, I choose not to use the COVWT weighting variable and instead use COVNUM.

[9] Based on the BLS data cited in the text, no more than 15% of covered employees were covered through a Section 125 cafeteria plan in 1995. In 1999, I estimate that 29% of covered employees were covered through a Section 125 cafeteria plan.

[10] Dranove et al (2000) use a model similar to mine to argue that employers charge a positive EPC in order to encourage their employees to obtain coverage through a spouse's employer. **Dranove, David; Spier, Kathryn E and Baker, Laurence.** "'Competition' among Employers Offering Health Insurance." *Journal of Health Economics*, 2000, *19*(1), pp. 121-40. Their argument is really about the effect of availability of alternative sources of insurance on the valuation of insurance, while my argument regarding family-plan EPCs focuses on the phenomenon I term "relevance." The fact that coverage for dependents is only relevant to a subset of workers implies that EPCs will be higher for family plans than single plans, even if no one has a working spouse. The Dranove et al (2000) model hinges on the presence of working spouses.

[11] The KFF/HRET survey suffers from a small sample (1938 firms total) and a high rate of item non-response for the worker income questions.

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Table 1. Utilities and profits

individual i's choice	individual i's utility	firm 1's profit from individual i
i does not work	RES	0
i works at firm 1 and does not take up	$WAGE_1(1-TAX)-E_i$	$1-WAGE_1$
i works at firm 1 and takes up	$WAGE_1(1-TAX)-E_i+VALUATION_i - EPC_1(1-TAX*DEDUCT)$	$1-WAGE_1-PREM+EPC_1$
i works at firm 2 and does not take up	$WAGE_2(1-TAX)-(DISTANCE-E_i)+VALUATION_i$	0
i works at firm 2 and takes up	$WAGE_2(1-TAX)-(DISTANCE-E_i)+VALUATION_i-EPC_2(1-TAX*DEDUCT)$	0

where:

i indexes individuals,

RES is the reservation (after-tax) income,

$WAGE_1$ ($WAGE_2$) is the wage offered by firm 1 (firm 2),

TAX is an income tax,

E_i is the commuting distance to firm 1 for individual i (or, the negative of individual i's preference for firm 1),

$DISTANCE$ is the distance between the two firms,

$(DISTANCE-E_i)$ is the commuting distance to firm 2 for individual i (or, the negative of individual i's preference for firm 2),

$VALUATION_i$ is individual i's valuation of health insurance,

EPC_1 (EPC_2) is the EPC charged by firm 1 (firm 2),

$DEDUCT$ is the fraction of the EPC that is tax deductible,

$PREMIUM$ is the health insurance premium,

$E \sim U[0,DISTANCE]$,

$P(VALUATION \neq 0)=PNONZERO$ and the distribution of $VALUATION$, conditional on being non-zero, is uniform over the interval $[VALMIN,VALMAX]$,

and E and $VALUATION$ are distributed independently.

Table 2. Choice (endogenous) variables

Variable	Definition/interpretation
$WAGE_1$	Wage offered by firm 1
$WAGE_2$	Wage offered by firm 2
EPC_1	Employee premium contribution (EPC) offered by firm 1
EPC_2	Employee premium contribution (EPC) offered by firm 2

Table 3. Exogenous Parameters (product of labor normalized to equal $1000)

Parameter	Definition/interpretation	Default Value
DISTANCE	Commuting distance between firms 1 and 2 (measured as a compensating differential)	$200
VALMIN	Minimum valuation of health insurance (among those with non-zero valuation)	$0
VALMAX	Maximum valuation of health insurance (among those with non-zero valuation)	$400
PNONZERO	Fraction of individuals with non-zero valuation of health insurance	100%
TAX	Income tax rate	30%
RES	Reservation income	$300
DEDUCT	Fraction of EPC that is tax deductible	0%
PREMIUM	Health insurance premium	$150

Table 4. Individual's Preferred Choice Expressed as a Set of Inequalities

individual i prefers ...	to ...	constraint	label
work at firm 1 and not take up	not work	$E_i < WAGE_1(1-TAX) - RES$	1
	work at firm 1 and take up	$VALUATION_i < EPC_1(1-TAX*DEDUCT)$	2
	work at firm 2 and not take up	$2E_i < (WAGE_1-WAGE_1)(1-TAX)+DISTANCE$	3
	work at firm 2 and take up	$2E_i+VALUATION_i < (WAGE_1-WAGE_1)(1-TAX)+DISTANCE+EPC_1(1-TAX*DEDUCT)$	4
work at firm 1 and take up	not work	$E_i - VALUATIONI < WAGE_1(1-TAX) - EPC_1(1-TAX*DEDUCT) - RES$	5
	work at firm 1 and not take up	$VALUATION_i > EPC_1(1-TAX*DEDUCT)$	6
	work at firm 2 and not take up	$2E_i-VALUATION_i < (WAGE_1-WAGE_1)(1-TAX)-EPC_1(1-TAX*DEDUCT)+DISTANCE$	7
	work at firm 2 and take up	$2E_i < (WAGE_1-WAGE_1)(1-TAX)-(EPC_1-EPC_1)*(1-TAX*DEDUCT)+DISTANCE$	8

Tables 5. Simulation Results (product of labor normalized to equal $1000)

Key Parameter	Parameter Value	Wage	EPC	EPC (% of premium)	Takeup rate
Maximum valuation of health insurance (VALMAX)	$100	$710	n/a*	n/a*	0%
	$300	$650	$70	47%	77%
	$500	$560	$0	0%	100%
Fraction of individuals with nonzero valuation of health insurance (PNONZERO)	25%	$700	$90	60%	19%
	50%	$680	$75	50%	41%
	75%	$650	$55	37%	65%
	100%	$560	$0	0%	100%
Income tax rate (TAX)	0%	$800	$150	100%	63%
	15%	$740	$115	77%	71%
	30%	$560	$0	0%	100%
	45%	$517	$0	0%	100%
Fraction of Employee Premium Contribution that is tax deductible (DEDUCT)	0%	$560	$0	0%	100%
	20%	$575	$10	7%	98%
	40%	$650	$75	50%	84%
	60%	$670	$100	67%	80%
	80%	$690	$125	83%	76%
	100%	$710	$150	100%	74%
Health insurance premium (PREMIUM)	$50	$660	$0	0%	100%
	$150	$560	$0	0%	100%
	$300	$700	$260	87%	35%
	$450	$710	n/a**	n/a**	0%
Maximum and minimum valuations of health insurance {VALMIN, VALMAX}	{$100, $200}	$560	$0	0%	100%
	{$0, $300}	$650	$70	47%	77%

* The equilibria consist of all contracts with $WAGE_1$=$WAGE_2$=$710 and EPC_1>=$100 and EPC_2>=$100.

** The equilibria consist of all contracts with $WAGE_1$=$WAGE_2$=$710 and EPC_1>=$400 and EPC_2>=$400 (note that the maximum valuation of health insurance is $400).

Notes:

1) All parameters, wages, EPCs and profits are expressed in units of labor output where the marginal (and average) product of labor is normalized to $1000.

2) In each simulation, only the value of the key parameter is varied. All other parameters are set at their default values: DISTANCE=$200 (distance between firms 1 and 2, measured as a compensating differential); VALMIN=$0 (minimum [technically infimum] valuation of health insurance among those with nonzero valuation); VALMAX=$400 (maximum valuation of health insurance among those with nonzero valuation); PNONZERO=100% (fraction of individuals with nonzero valuation of health insurance); TAX=30% (income tax rate); RES=$300 (reservation utility); DEDUCT=0% (fraction of EPC that is tax deductible); PREMIUM=$150 (health insurance premium).

3) Firm profits are calculated per individual without conditioning on whether the individual works. Firm profits should, therefore, be interpreted as total profits rather than profits per worker or profits per unit output.

4) Wages can take values between RES and $1000 (inclusive) in increments of $10, and EPCs can take values between $0 and VALMAX (inclusive) in increments of $5.

5) When multiple equilibria occur, profits for firms 1 and 2 are added and the equilibrium with the highest total profits is presented.

6) To calculate average EPCs and wages for each equilibrium, the EPCs and wages at the two firms are averaged using the number of covered workers at each firm as the weight.

Table 6. Alternative Definitions of the Employee Premium Contribution

Definition of Employee Premium Contribution (EPC)	If firm does not use a Section 125 cafeteria plan	If firm uses a Section 125 cafeteria plan
Paycheck deduction (as is)	monthly paycheck deduction	monthly paycheck deduction
Paycheck deduction only	monthly paycheck deduction	$0
Cafeteria only	$0	health insurance premium
Paycheck deduction plus cafeteria	monthly paycheck deduction	health insurance premium

Table 7. Average Monthly Employee Premium Contributions and Health Insurance Premiums (*95% confidence intervals in parentheses*) (N=1810)

	Single Plan	**Family Plan**
Average Health Insurance Premium	$174 (*168-181*)	$474 (*451-496*)
Average "Paycheck deduction (as is)" EPC	$25 (*21-29*)	$127 (*103-151*)
Average "Paycheck deduction (as is)" EPC / Average Health Insurance Premium	14.3%	26.8%
Average "Paycheck deduction plus cafeteria EPC"	$71 (*55-87*)	$240 (*213-267*)
Average "Paycheck deduction plus cafeteria" EPC / Average Health Insurance Premium	40.6%	50.7%

Notes:
1) 116 of the 1938 firms in the survey are excluded because they do not offer health insurance. 12 firms are excluded because they report that they "Don't know" whether they offer a cafeteria plan.
2) "As is" EPC equals the monthly paycheck deduction reported in the KFF/HRET survey. At firms that do not use a cafeteria plan, "Paycheck deduction plus cafeteria EPC" equals the "As is EPC." At firms that do use a cafeteria plan, "Paycheck deduction plus cafeteria EPC" equals the health insurance premium.
3) Firm-level premiums and EPCs are weighted by the number of covered employees as each firm.
4) The number of covered employees at each firm was used as the sample weight.
5) 95% confidence intervals are calculated in STATA using the SVYMEAN command.

Table 8. Use of Cafeteria Plans and Positive Monthly Paycheck Deductions, by Firm-level Fraction of Workers with Low Income (*95% confidence intervals in parentheses*)

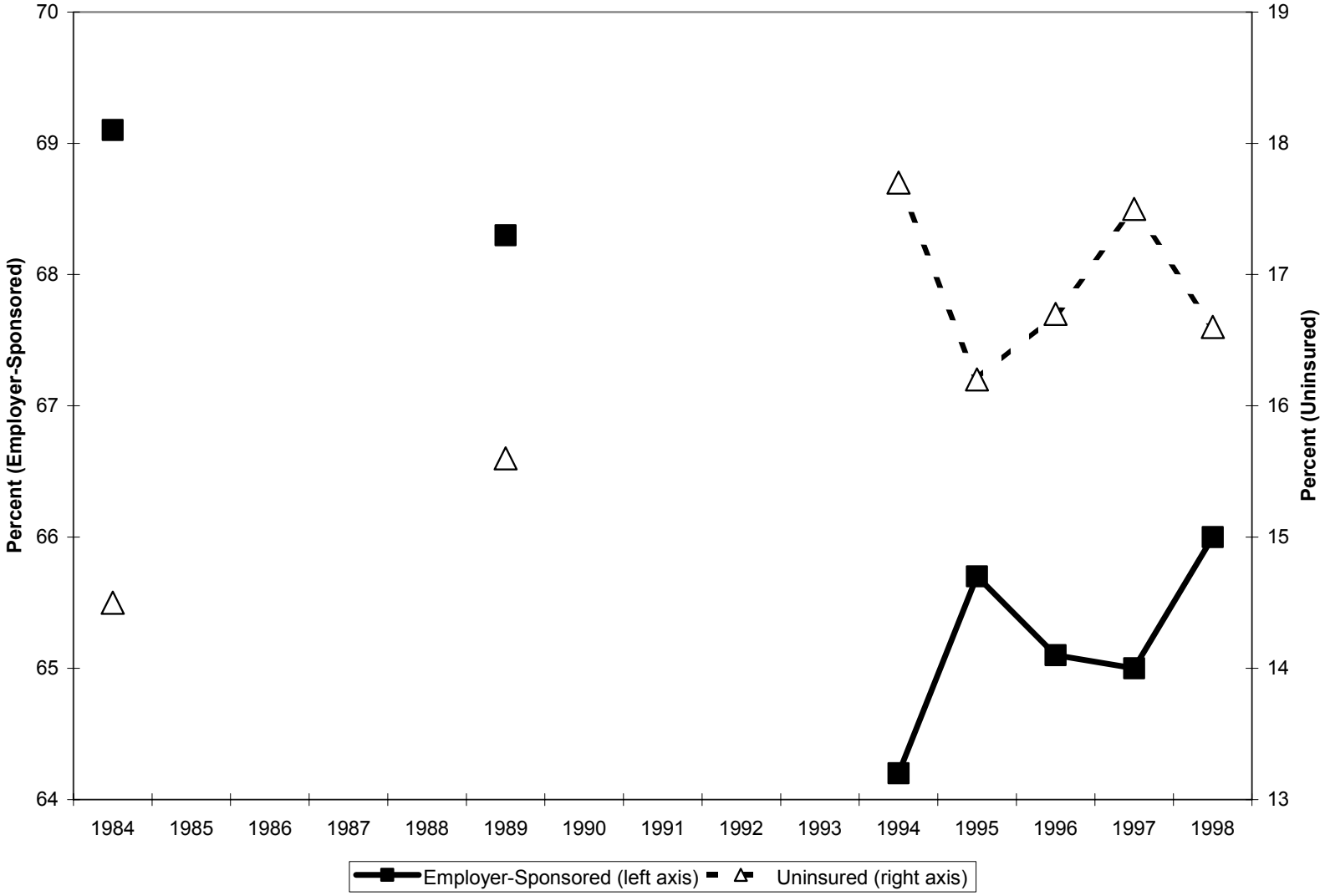
Firm-level fraction of workers low-income	N firms	Firm uses Cafeteria plan	Monthly deductible>0, Single plan	Monthly deductible>0, Family plan
<10%	636	36.6% (*23.4%-49.9%*)	69.4% (*55.5%-83.2%*)	76.4% (*62.5%-90.4%*)
10-35%	382	32.7% (*17.7%-48.0%*)	77.8% (*64.5%-91.2%*)	90.0% (*77.2%-100.0%*)
>35%	446	22.7% (*10.3%-35.1%*)	85.8% (*77.5%-94.3%*)	97.3% (*94.3%-100.0%*)
All firms	1810	29.3% (*20.8%-37.7%*)	66.8% (*52.9%-80.8%*)	86.9% (*81.0%-92.8%*)

Notes:

1) Of the 1938 firms in the KFF/HRET sample, 116 are excluded because they do not offer health insurance benefits and 12 are excluded because they do not report whether they used a cafeteria plan. When generating results by fraction of the firms workers with low income, 356 firms were excluded because did not report data on the fraction of workers with low incomes. Unfortunately, the 356 firms that do not report income data represent (out of 1810 firms that offer health insurance and report whether they used a cafeteria plan) 51% of the covered employees.

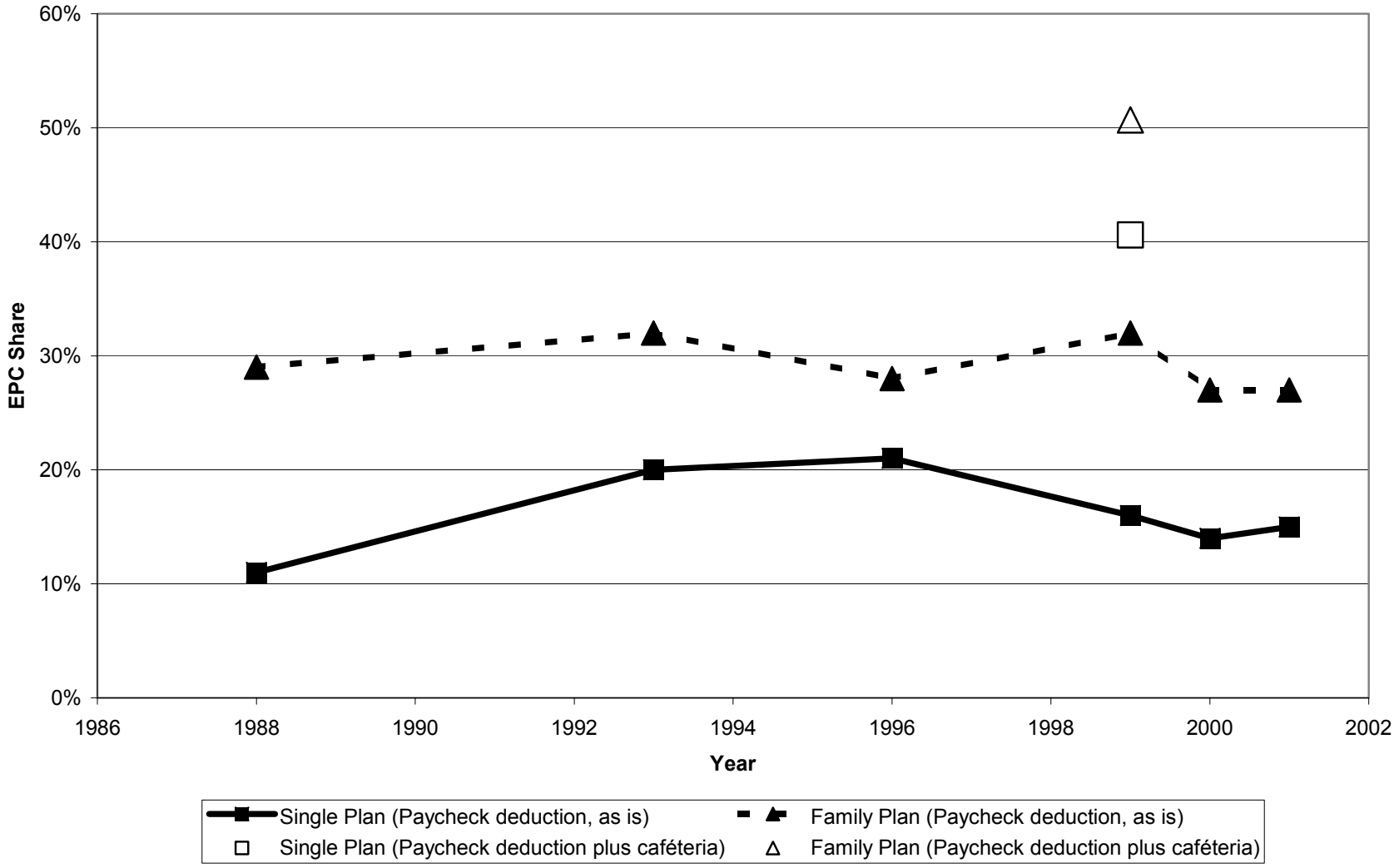
2) The number of covered employees at each firm was used as the sample weight.

Figure 1. Fraction of US Non-Eldely Population with Employer-Sponsored Health Insurance Coverage (left axis) and Uninsured (right axis), Selected Years from 1984 to 1998



Source: Source: National Center for Health Statistics. "Health, United States, 2001," Hyattsville, Maryland: Public Health Service, 2001. Tables 128, 129 and 130.

Figure 2. Average Employee Share, with Alternative Employee Share Calculated for 1999



Source: Kaiser Family Foundation. "Trends and Indicators in the Changing Health Care Marketplace, 2002," Washington, DC: Kaiser Family Foundation, 2002.